Two New Species of Frogfishes (Antennariidae) from Easter Island[1]

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ABSTRACT: Two new species of frogfishes, *Antennarius randalli* and *Antennarius moai,* are described from Easter Island. The closest relative of the former is *A. pauciradictus* and of the latter, *A. verrucosus,* both from the western Atlantic.

EASTER ISLAND (Isla de Pascua or Rapa Nui), lying on the easternmost fringe of Polynesia (27°6′ S, 109°17′ W), is of considerable interest to biologists because of its extreme geographical isolation. Only recently have extensive fish collections been made at the island. Ramsey Parks and the crew of the ketch "Chiriqui" made a valuable collection in 1958. The "Chiriqui" material which includes the paratype of *Antennarius moai* is housed at the Los Angeles County Museum. An extensive collection was obtained by Ian Efford and his associates during the Canadian Medical Expedition in 1964–1965. Prior to this expedition, a total of 40 species had been recorded (Kendall and Radcliffe, 1912; Regan, 1913; Fuentes, 1914; Rendahl, 1921; Wilhelm and Hulot, 1957; De Buen, 1963). Most of the fishes collected by Efford have been sent to various specialists and remain unreported at this date. No antennariids were collected by the Canadian expedition or reported by earlier workers.

John E. Randall and the author collected fishes at Easter Island for one month in 1969. Rotenone collections were made in a variety of habitats, from shallow lava pools, to depths of 43 meters with the use of SCUBA gear. Additional deep water species were taken by handline from native vessels. Five specimens belonging to two undescribed species of *Antennarius* were collected and are described below. Both species belong to the genus and subgenus *Antennarius* as defined by Schultz (1957).

METHODS OF COUNTING AND MEASURING

Measurements of the holotypes and paratypes of *A. randalli* and *A. moai* were made with a needle-point dial caliper to the nearest one-tenth of a millimeter. X-rays were utilized for making counts and proportional measurements of fin rays, since fleshy membranes obscure these structures. The peculiar morphology of antennariids necessitates the definition of the following measurements:

Head length: from the anteriormost point of the upper jaw to the gill opening on the lower pectoral fin base.

Eye diameter: the greatest horizontal measurement of the bony orbit (which may be partially hidden by a thin layer of integument).

Caudal peduncle length: the horizontal measurement connecting two vertical and parallel lines, one passing through the base of the last dorsal ray and the other tangent to the base of the middle caudal rays.

MATERIAL EXAMINED

All antennariid material at the following institutions was examined while attempting to identify the Easter Island specimens (the abbreviations in parentheses are used in the subsequent text): U.S. National Museum (USNM); American Museum of Natural History; Academy of Natural Sciences of Philadelphia; Field Museum of Natural History, Chicago (CNHM); California Academy of Sciences (CAS); Bernice P. Bishop Museum, Honolulu (BPBM). In addition, the paratype of *Antennarius moai* was sent to the author by the Los Angeles County Museum (LACM).

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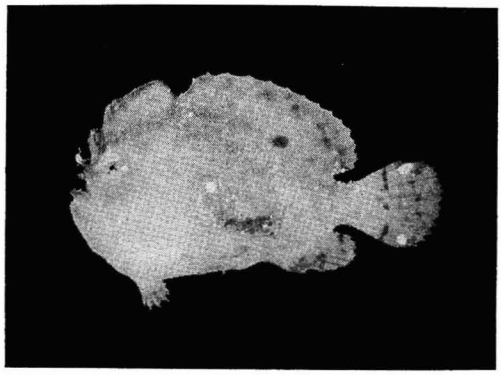

FIG. 1. *Antennarius randalli,* holotype, standard length 17.7 mm. (Photo by John E. Randall.)

Antennarius randalli sp. nov.

Figs. 1, 2*a*; Tables 1 and 2

HOLOTYPE: BPBM 6554, 17.1 mm standard length, collected with emulsified rotenone (Chemfish) off Motu Tautara, west coast of Easter Island in 20 meters by J. Randall and G. Allen on February 7, 1969. The substratum of the type locality consisted mostly of rocks with a heavy cover of *Sargassum* and other brown algae.

PARATYPES: USNM 204310, 19.8 mm standard length, collected offshore between Hanga Roa and Hanga Piko, Easter Island, depth 13 meters, in vicinity of large coral head with adjoining scattered rock and sand bottom, Chemfish, J. Randall and G. Allen, February 10, 1969; CAS 24417, 16.4 mm standard length, same collecting data as preceding specimen; BPBM 6553, 18.5 mm standard length, same data as preceding.

DIAGNOSIS: A species of *Antennarius* with the following characters: 12 or 13 soft dorsal rays, the last two or three of which are

TABLE 1

MEASUREMENTS OF THE TYPE SPECIMENS OF *Antennarius randalli* AND *A. moai*
(expressed in thousandths of the standard length)

	A. randalli				*A. moai*	
CHARACTERS	HOLOTYPE BPBM 6554	PARATYPE CAS 24417	PARATYPE BPBM 6553	PARATYPE USNM 204310	HOLOTYPE BPBM 6555	PARATYPE LACM 6560-12
Standard length (mm)	17.7	16.4	18.5	19.8	21.3	57.5
Greatest depth of head	615	585	541	555	600	600
Greatest width of head	248	244	276	263	413	337
Head length	638	640	665	682	704	638
Snout length	62	79	59	76	89	80
Eye diameter	101	110	97	101	103	77
Interorbital width	101	104	91	101	99	118
Least depth of caudal peduncle	158	152	124	146	150	146
Length of caudal peduncle	177	190	156	150	145	179
Snout to origin of soft dorsal fin	418	451	405	419	427	499
Snout to origin of anal fin	763	780	810	797	793	812
Length of base of soft dorsal fin	638	598	578	551	573	600
Length of base of anal fin	271	280	249	263	258	245
Length of longest pectoral ray	225	226	216	232	188	209
Length of pelvic fin	147	134	130	121	164	177
Length of bony part of 1st dorsal spine	52	65	65	52	94	90
Length of bony part of 2nd dorsal spine	113	122	124	106	117	113
Length of bony part of 3rd dorsal spine	328	287	286	318	178	210
Longest (8th) soft dorsal ray	243	226	222	263	249	237
Longest (5th) anal ray	225	250	205	207	217	220
Length of caudal fin	384	366	335	328	329	240

branched; bony part of first dorsal spine about ½ the length of second dorsal spine; caudal peduncle short, but distinct; last pelvic ray divided; pectoral rays 9; skin covered with minute unbranched papillae.

DESCRIPTION (See Table 1 for measurements of the holotype and paratypes): Dorsal rays I-I-I, 13 (12–13 on paratypes), all soft dorsal rays simple except tenth to twelfth (only penultimate eleventh or twelfth branched on paratypes); anal fin with 7 branched rays; pectoral rays 9, all simple; pelvic rays I, 5, all simple; caudal rounded, with 9 rays; vertebrae 18.

Body deep, the depth 1.6 (1.6–2.0) in standard length; head compressed, the width about 4.0 (3.6–4.0) in standard length; head width maximal midway between snout and gill opening; mouth large, nearly vertical; maxillary concealed under skin, reaching below anterior portion of eye; jaws with several rows of depressible, nearly horizontal, posteriorly directed villiform teeth of varying lengths, the longest about 3 times the length of the shortest; tongue broad, thick, rounded at anterior edge, with dark pigment concentrated anteriorly and posteriorly on upper surface (faint on the holotype); anterior portion of upper surface of tongue with a circular patch of approximately 12 small wartlike protuberances; lower jaw with a bony knob at symphysis, covered with movable integument which is sometimes pigmented; nostrils tubular, their length about ⅓ the diameter of the eye, protruding from bulbous swellings over the premaxillary; internasal area concave with a triangular flap of skin bearing a median fleshy ridge (apex of flap directed posteriorly); nares and internasal depression may be pigmented; bony portion of first dorsal spine (illicium) about half the length of second dorsal spine, bearing at its tip a fleshy esca ("bait") consisting of a central globular mass with 10–20 club-shaped tentacles (more visible when immersed), the tips of which may be pigmented (Fig. 2*a*); length of these tentacles about 0.5–0.75 that of bony portion of illicium; second dorsal spine with membrane extending from tip to base of third dorsal spine; third dorsal spine bound firmly to body by a rectangular (nearly triangular on paratypes), fleshy membrane extending to and continuous with basal portion of soft dorsal fin (upper edge of this membrane parallel with contour of head and reinforced with a bony extension of the fin spine); length of membrane about 2 times the height; length of first soft dorsal ray contained 1.3 (1.2–1.4) times in length of longest (eighth) ray; length of first anal ray contained 1.2 times in length of longest (fifth) anal ray; membrane of soft dorsal and anal fin confluent with caudal fin base in two paratypes;

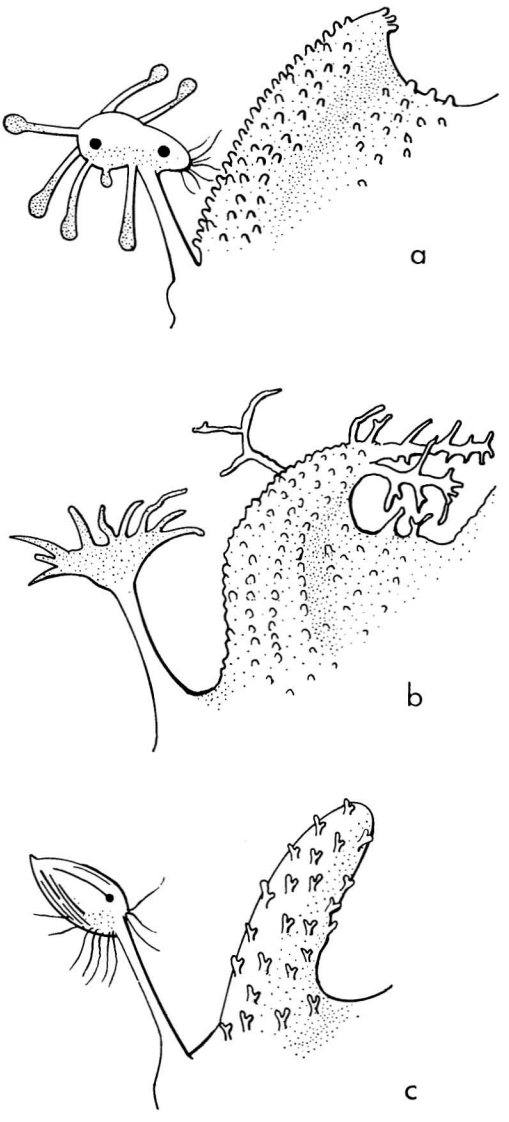

FIG. 2. Esca structures of certain species of *Antennarius: a, A. randalli* (drawn from the holotype); *b, A. pauciradiatus* (after Böhlke and Chaplin, 1968); *c, A. moai* (drawn from the paratype). Illustrations by Susan Monden.

gill opening at lower pectoral fin base ("elbow" position); body, fins, and second and third dorsal spines covered with minute papillae; many of the dark pigment spots on the body and fins with an enlarged papilla at their center; a line of pores of the acoustico-lateralis system begins on snout, passes over eye, curves gently to base of fifth soft dorsal ray, runs parallel to dorsal fin base to tenth soft ray, then plunges to middle of anal fin base and continues horizontally to lower portion of caudal peduncle; another series of pores extends from the chin downward, curving far below the mouth, then upward to slightly below eye level (there are approximately 20 pores from snout to caudal base and 10 pores in the suborbital line); several other pores scattered on head.

Color in alcohol: Ground color uniformly light tan, nearly devoid of pigmentation (paratypes "peppered" with variable number of brown spots); fins whitish, semitranslucent (those of paratypes finely bordered with black); dark spot (approximately ⅓ eye diameter) near base of eighth or ninth dorsal ray faded on holotype, but present on two paratypes; diffiuse dark bar at caudal base, a second may be present across mid region of caudal fin; abdomen pale tan or whitish; dark pigment on floor of mouth and tongue may be present in form of two lateral bands converging toward the front.

Color of holotype shortly after death: Ground color rich yellowish brown with a faint spotting of darker brown (two paratypes with reddish ground color, one of these with light gray patches which are concentrated dorsally below soft dorsal fin base and above and forward of pectoral fin base); a small blackish spot between base of eighth and ninth dorsal rays; two white spots on caudal fin, one near upper edge of fin and one directly below it near lower edge; a white spot on side anterior to and above pectoral base; a smaller white spot just behind eye and another below origin of soft dorsal; a few smaller white flecks on sides; esca whitish; black markings at caudal fin base and edge of fins as noted above under color in alcohol; abdomen pale tan.

REMARKS

A. randalli appears to be closely related to *A. pauciradiatus* Schultz (1957) of the western Atlantic. Both these species are characterized by a low pectoral ray count (9), great disparity of size between the second and third dorsal spines, pale coloration, small size (of 12 specimens of *A. pauciradiatus* examined at the USNM and CNHM, the largest was 40 mm standard length, with an average length of 22.5 mm for all specimens).

All the specimens of *A. pauciradiatus* which were examined had 12 soft dorsal rays, while two of the type series of *A. randalli* have 13 rays and the other two have 12. A more positive difference was found in the length of the caudal peduncle and caudal fin of the two species (Table 2) and in the structure of the esca (Fig. 2*a, b*). Schultz (1957) uses the structure of the esca and illicium as key characters for separating the members of this group. However, these structures are sometimes damaged or missing, and there is morphological variation in the esca within a given species. Although both species are generally pale in coloration, *A. randalli* tends to be "peppered" with a variable number of brown spots. *A. pauciradiatus* may have a few small spots, but generally there are not as many. Both species may have a small spot near the base of the soft dorsal fin in the vicinity of the eighth and ninth dorsal rays.

This species is named after John E. Randall who made it possible for the author to participate in the Easter Island expedition of 1969.

TABLE 2

COMPARISON OF CAUDAL PEDUNCLE LENGTH AND LENGTH OF MIDDLE CAUDAL RAYS OF *Antennarius randalli* AND *A. pauciradiatus*
(Measurements expressed in thousandths of the standard length)

SPECIES	STANDARD LENGTH (mm)	LENGTH OF CAUDAL PEDUNCLE	LENGTH OF MIDDLE CAUDAL RAYS
A. pauciradiatus			
USNM 116764	29.0	189	396
116764	27.5	196	385
153223	25.5	196	346
153223	20.0	205	425
A. randalli			
BPBM 6554	17.7	177	384
6553	18.5	156	335
CAS 24417	16.4	190	366
USNM 204310	19.8	150	328

Antennarius moai sp. nov.
Figs. 2*c*, 3; Table 1.

HOLOTYPE: BPBM 6555, 21.3 mm standard length, collected with emulsified rotenone (Chemfish) in large tide pool between Hanga Roa and Hanga Piko, Easter Island, in 1 meter by G. Allen and J. Randall on January 26, 1969. The substratum of the type locality consisted of lava rock with scattered boulders.

PARATYPE: LACM 6560-12, 57.5 mm standard length, collected with rotenone 100 yards northeast of sand beach on east side of Anakena Cove, Easter Island, in 3 to 5 meters by Ramsey Parks and crew of ketch "Chiriqui" on October 1, 1958. The substratum of this locality consisted of boulders 1 to 2 meters in diameter, with some coral heads and brown algae. Water temperature 20.5° C.

DIAGNOSIS

A species of *Antennarius* with the following characters: 12 soft dorsal rays, the last two or three of which are branched; bony part of first dorsal spine slightly shorter than second dorsal spine; body without bold zebra-like markings; caudal peduncle short, but distinct; last pelvic ray divided; pectoral rays 11 or 12. Skin covered with minute bifid and trifid denticles.

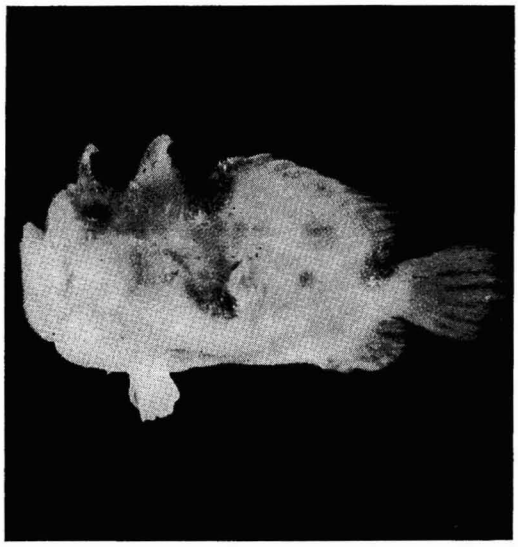

FIG. 3. *Antennarius moai*, holotype, standard length 21.3 mm. (Photo by John E. Randall.)

DESCRIPTION (see Table 1 for measurements of the holotype and paratype): Dorsal rays I-I-I, 12, all soft rays simple except last two (last three on paratype); anal fin with 7 branched rays; pectoral rays 11 (12 on left side of paratype), all simple, caudal rounded, with 9 rays; vertebrae 18.

Body deep, the depth 1.7 (1.6) in standard length; head compressed, the width about 2.4 (3.0) in standard length; head width maximal midway between snout and gill opening; mouth large, nearly vertical; maxillary concealed under skin; jaws, vomer, palatines, and back of tongue with several rows of depressible, posteriorly directed villiform teeth of varying lengths; tongue broad, thick, rounded at anterior edge; lower jaw with a bony knob at symphysis, covered with movable integument; nasal area slightly swollen, with several lumps, but no tubules visible; internasal area concave; bony portion of illicium about half the length of second dorsal spine, bearing at its tip a fleshy esca consisting of a small globular mass from which numerous filaments may radiate (Fig. 2*c*); second dorsal spine free with a naked (no denticles) pit behind; third dorsal spine with thick, fleshy membrane extending from tip of spine to base of soft dorsal (on the paratype the spine is bound closely to the back, while on the holotype there is more freedom of movement); length of first soft dorsal ray contained 1.6 times in length of longest (ninth) dorsal ray; length of first anal ray contained 1.6 (1.9) times in length of longest (fifth) anal ray; gill opening at "elbow" of pectoral fin; body, fins, and second and third dorsal spines profusely covered with tiny bifid and trifid denticles giving the body the texture of fine sandpaper; conspicuous line of acousticolateralis pores begins on snout, passes above eye, curves gently upward in direction of dorsal origin and then plunges diagonally to rear base of anal fin where it terminates; another line of pores extends from the chin downward, curving below the mouth, then upward, joining the lateral line behind the eye (there are approximately 17 lateral line pores and 16 circumorbital pores); additional line of pores on side of head extending from lateral line to base of third dorsal spine.

Color in alcohol: Body and fins largely light gray-brown; pale whitish saddle between third dorsal spine and third soft dorsal ray; upper

pectoral base similarly whitish; three whitish spots about size of eye along middle of sides, the first above pectoral base, the second below middle of soft dorsal and the third forming a saddle between the last soft dorsal ray and upper caudal base; faint spot about size of eye present at base of eighth to tenth soft dorsal rays; body pale or whitish ventrally; paratype primarily light gray-brown, lacking pale saddles behind third dorsal spine and on caudal peduncle; whitish areas on sides larger on paratype but less distinct and spot at base of eighth to tenth rays about 3 times larger than eye diameter.

Color of holotype shortly after death: Ground color of body and fins light gray with yellowish cast on sides; saddles and spots which appear whitish in alcohol are red; chin and ventral portion of body whitish.

REMARKS

The closest Indo-Pacific relatives appear to be *Antennarius nummifer* (Cuvier, 1817) and *A. indicus* Schultz (1964). However, both these species differ from *A. moai* in number of pectoral rays, a character recognized as important by Schultz and earlier workers. *A. nummifer* normally has 10 pectoral rays, while *A. indicus* has 13. *A. verrucosus* Bean (1906) from the western Atlantic is closely related. Fin ray counts and gross morphology are essentially identical to those of *A. moai*. However, these two species are easily differentiated on the basis of color pattern, particularly that of the fins. *A. verrucosus* has a bold leopard-like pattern of streaks and blotches on the fins and body, while these markings are absent on *A. moai*.

Moai is the Rapa Nui name for the gigantic stone monoliths which were hewn from the Ranorarаku Quarry several hundred years ago by the early Polynesian inhabitants of the island.

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